(12) UK Patent Application (19) GB (11) 2 230 558 (13) A

(43) Date of A publication 24.10.1990

(21) Application No 8908603.7

(22) Date of filing 15.04.1989

(51) INT CL[5]
E05F 11/48

(52) UK CL (Edition K)
E2M M1B M1D

(56) Documents cited
None

(58) Field of search
UK CL (Edition J) E2M
INT CL[4] E05F

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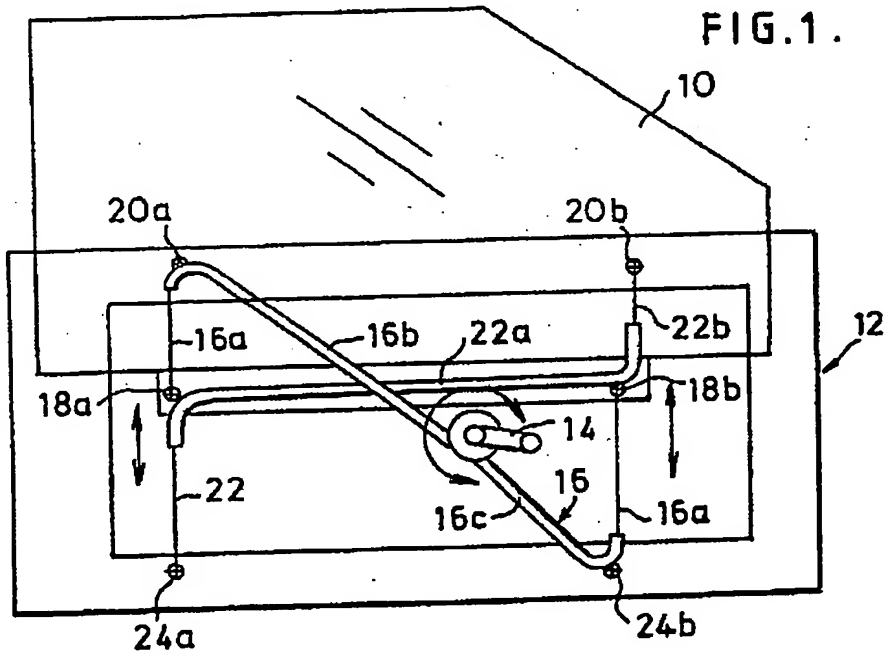
(54) Regulating system for motor vehicle window

(57) The system is for a vertically sliding window wherein the raising and lowering forces are applied to one side of the window only. As shown, cables 16*a* are movable by handle 14 to raise and lower the window 10. To counteract the tilting force produced by driving only one side of the window, an outer sheath 22*a* is attached to window 10 and an inner cable 22*b* attached to points 24*a*, 20*b* on the door. The friction between the sheath and inner cable causes an anti-tilting force to be applied to the window counteracting that applied by cable 16*a* or 22*b*. Other arrangements of the cable are described.

FIG.1.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The references to figure 5 of the drawings in the printed specification are to be treated as omitted under Section 15(3) of the Patents Act 1977.

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FIG.1.

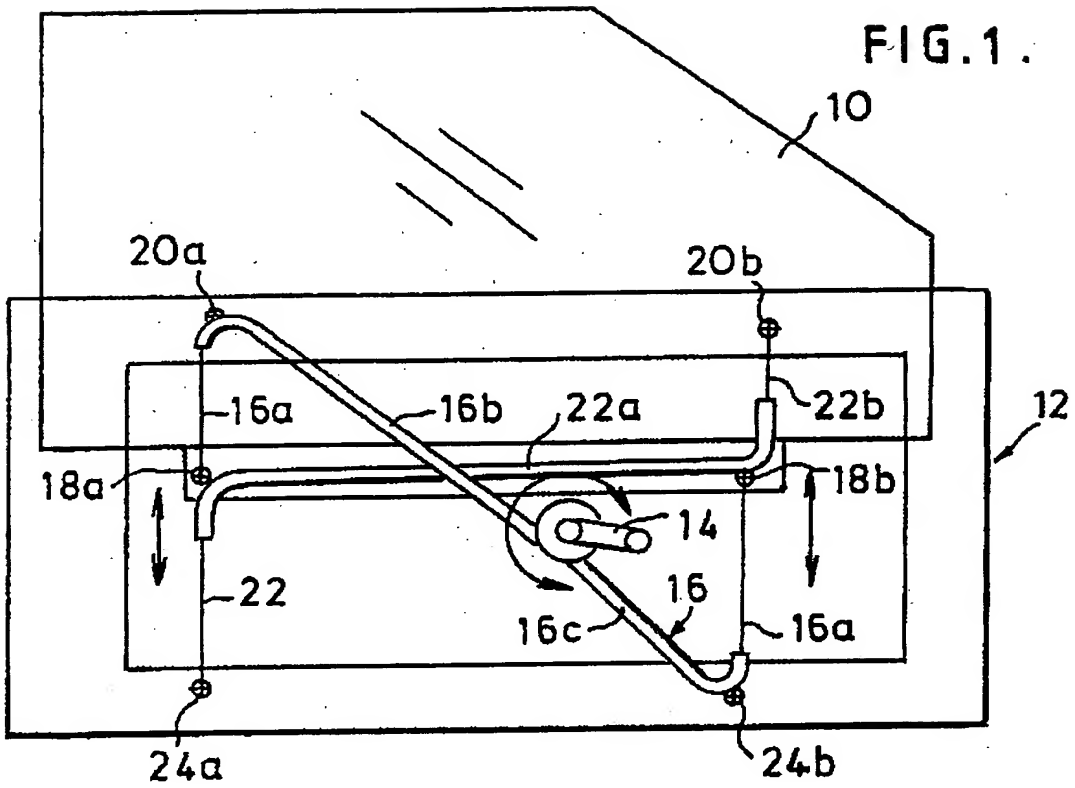

10
20a
20b
16a
16b
22a
22b
12
18a
18b
14
22
16
16c
16a
24a
24b

FIG.2.

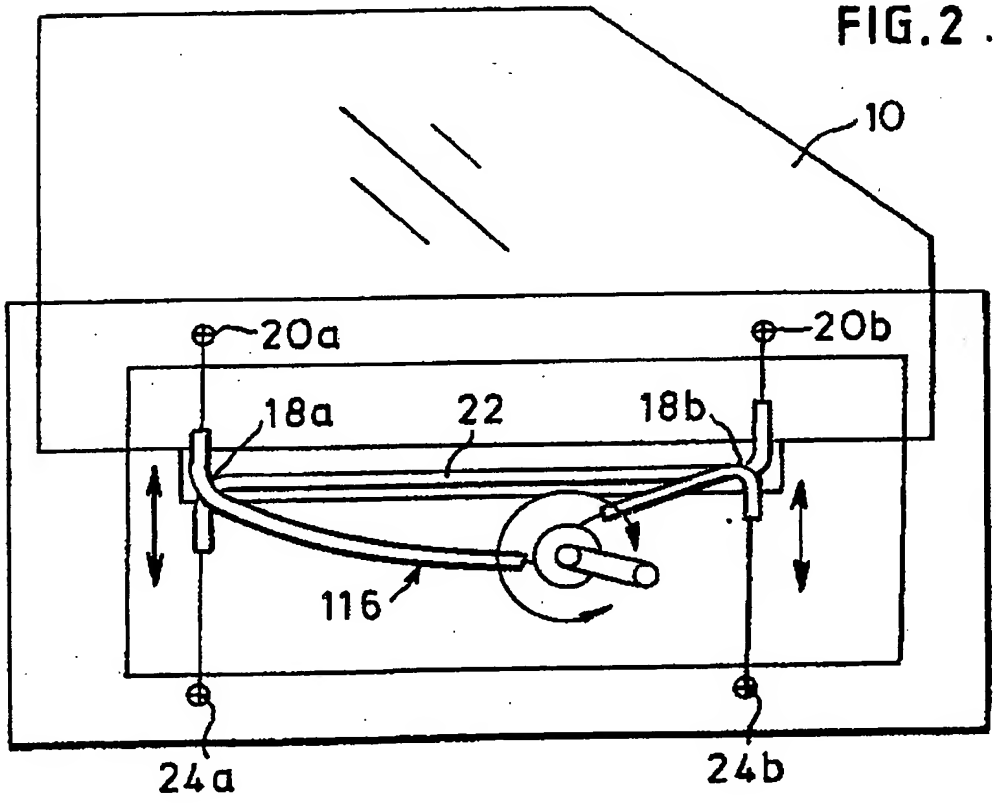

10
20a
20b
18a
22
18b
116
24a
24b

FIG.3.

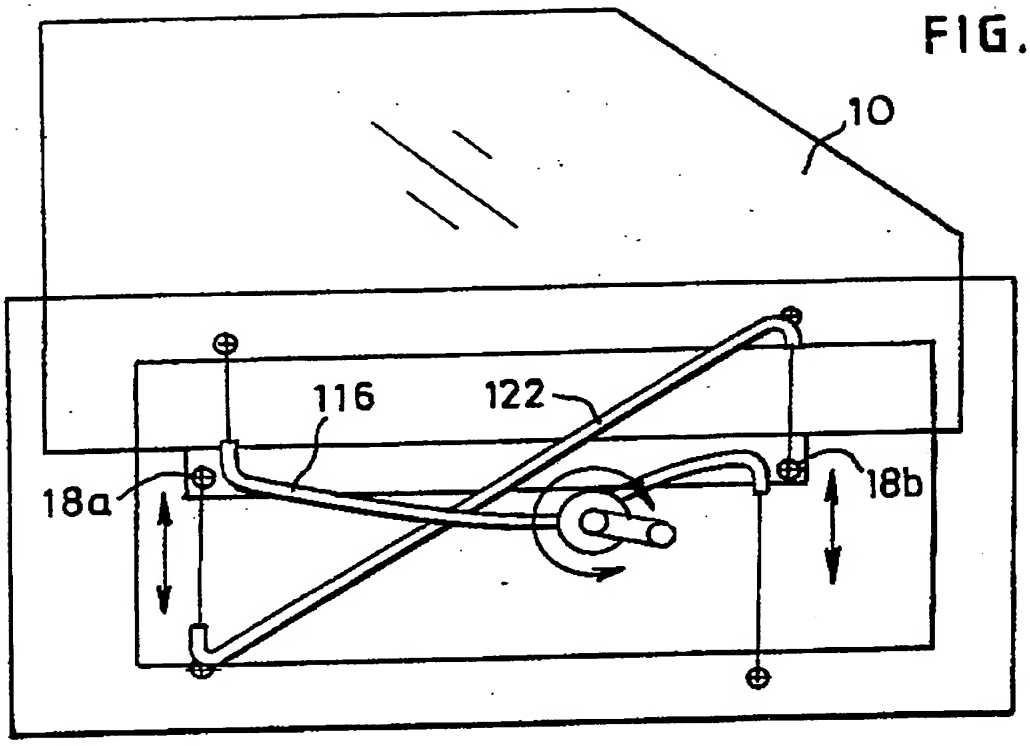
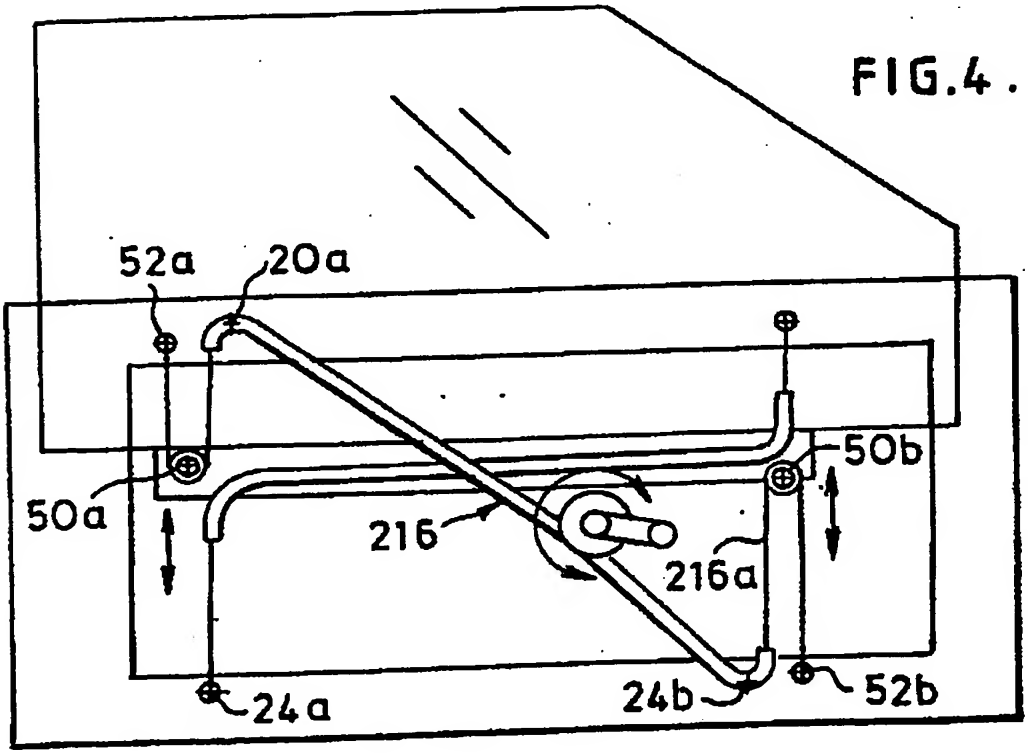


FIG.4.



REGULATING SYSTEM FOR MOTOR VEHICLE WINDOW

The present invention relates to a regulating system for a motor vehicle window, that is to say a mechanism for raising and lowering a window in its guides.

Various regulating systems have been used in the past to raise and lower a window in a vehicle. One known system employs rigid plates hinged in a form of lazy tongues configuration to raise and lower the window as a cranking handle is turned. The disadvantage of such a system is that it presents difficulty in assembly and hinders access to other items such as the door handle and the lock.

It is also known to use a Bowden cable to raise and lower a window. The inner cable of a Bowden cable passes around a drum which is turned by a cranking handle or an electric motor and is connected to an anchoring point on the window. As the drum is turned, the end of the cable raises or lowers the window.

Cable operated regulating systems can be single lift or double lift. In the former case, the window is raised from a single point and steps must be taken to ensure that the window does not tilt in its guides while it is being moved as this might lead to jamming.

In the case of double lift systems, either two separately driven cables may be employed or a single driven cable may be wound in a figure eight around guides or pulleys and attached at two points to the window.

According to the present invention, there is provided a regulating system for a motor vehicle window located in guides in a vehicle door, which system comprises means for connection to one side of the window for raising and

lowering the window within the window guides, and a Bowden cable connected in use only to the window and to the vehicle door and operative to move the other side of the window in synchronism with and in response to movement of said one side.

In the present invention, the Bowden cable provides a connection between the two sides of the window with a unity velocity ratio so that the window automatically moves in its frame without a tendency to tilt or to jam.

In a first embodiment of the invention, the outer sheath of the Bowden cable is mounted for movement with the window and the ends of the inner cable are anchored, in use, to fixed points on the vehicle door.

In alternative embodiment, the outer sheath of the Bowden cable is fixed relative to the vehicle door and the ends of the inner cable are connected to the window.

The means for raising and lowering the window may comprise a manually or electrically driven drum and a second Bowden cable acting between the vehicle door and the window to move the window in response to the rotation of drum.

Various possibilities also present themselves for the connections of the second Bowden cable but in the preferred embodiment, the outer sheath of the second Bowden cable is fixed to the window frame and the inner cable has a central portion wound about the drum and its two ends connected to the window and to the vehicle door respectively.

The invention will now be described further, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic representation of a first embodiment of the invention, and

Figures 2 to 5 are similar representations of alternative embodiments of the invention.

Figure 1 show a window 10 mounted for vertical movement in a door frame 12, the window 10 being disposed between guides which are not shown. The guides may form a frame around the window when raised or they may be disposed entirely within the door panel in the case of a frameless window.

A cranking handle 14, mounted on the door in a manner not shown, forms part of the means for raising and lowering the window 10. The handle 14 is connected to a drum about which there are wound several turns of the inner core 16a of a Bowden cable 16. The ends of the inner core 16a of the Bowden cable 16 are secured to respective anchoring points 18a and 18b on the window.

The outer sheath of the Bowden cable 16 has two parts 16b and 16c of which the part 16b is anchored at 20a to an upper member of the door and the part 16c is anchored at 24b to a lower member of the door.

The parts of the regulating system so far described, permit the window 10 to be raised and lowered by acting on anchoring points 18a and 18b offset from the centre of gravity of the window 10. In particular, if cranked clockwise, the handle 14 will shorten the length of the inner cable between the point 18b and 14b and thereby pull the window down. At the same time the run of the inner core 16a between the points 20a and 18a is

lengthened so that the window can fall at this end under its own weight. In practice, the run of the inner core 16a between the points 20a and 18a is in tension when the window is fully raised and the window starts to fall under its own weight before being pulled down by the shortening of the run between the points 18b and 24b.

Counter-clockwise rotation of the handle will conversely raise the window 10 relative to the door 12 by shortening the run between the points 18a and 20a while lengthening the run between the points 18b and 24b.

Gravity acts on the window 10 through its centre of gravity but the lifting force on the window which opposes gravity is always applied at the point 18a which is offset from the centre of gravity. Consequently, there is a torque acting on the window tending to make it jam within its guides.

To alleviate this tendency to jam, a second Bowden cable 22 is provided which is not connected to the handle 14 or its drum but only to the window 10 and to the door 12. The outer sheath 22a of the second Bowden cable 22 is anchored near the lifting points 18a and 18b on the window whereas the ends of the inner core 22b of the cable are anchored to fixed points 20b on the upper door member and 24a on the lower door member. As far as possible, the points 20a, 18a and 24a on the left side and the points 20b, 18b and 24b on the right side should lie on lines parallel to the window guides.

As the window is lowered, the run of the inner core 22b between the points 18a and 24a will now be reduced and the length of the run between the points 18b and 20b increased. The tension in the latter run will therefore be slowly released to allow the window to drop in synchronism with the right hand end, as viewed.

Conversely, when the window is raised, the run between the points 18a and 24a will be increased in length and the run between the point 18b and 20b reduced in length to raise the right hand end of the window 10, as viewed, in response to raising of its left hand end.

The connections of the inner core and the outer sheath of Bowden cables can be inter-changed and this will be clearer from the remaining embodiments illustrated in the drawings.

The embodiment of Figure 2 differs from that of Figure 1 in that as compared with the cable 16 in Figure 1, the connections of the first Bowden cable 116 have been reversed. The two parts of the outer sheath of the cable 116 are now anchored to the window 10 and it is the ends of the inner core of the cable 116 that are attached to the points 24b and 20a on the door members. There is no essential difference in the operation of this embodiment from that previously described.

The embodiment of Figure 3 differs from that of Figure 2 in that as compared with the cable 22 in Figure 1, the connections of the second Bowden cable 122 have been reversed. The ends of the outer sheath of the 122 are anchored to the upper and lower members and it is the ends of the inner core of the cable 122 that are attached to the points 18a and 18b on the window 10. There is again no essential difference in the operation of this embodiment from those previously described.

The embodiment of Figure 4 illustrates that a reduction wire system can be used in conjunction with the Bowden cable to alter the mechanical advantage of the regulating system. As compared with the embodiment of Figure 1, instead of the ends of the inner core 16a of the Bowden cable 16 being attached directly to the lifting points 18a and 18b on the window 10, the inner

core 216a of the cable 216 passes around pulleys 50a and 50b at the lifting points 18a and 18b and is then anchored to stationary fixing points 52a and 52b adjacent the points 20a and 24b, respectively.

In this case, the rate of movement of the window is one half of the rate of movement of the inner core 216a of the Bowden cable 216.

It will be appreciated that many other configurations of cable connections can be employed without departing from the scope of the invention as set out in the appended claims.

In all the embodiments of the invention, the window is raised and lowered by means of a single lift system and the raising of the other end is effect by coupling the ends of the window to one another using a Bowden cable to provide a double lift system without the complication of using two cables each wound on a separate drum and acting on a different end of the window. Apart from the issue of expense, it is difficult to fit two such drums within the thickness of a door where space is at a premium.

An advantage of the invention is that it reduces the complexity of the regulating mechanism and allows it to be installed more simply. The invention also lends itself well to the regulation of windows which do not move vertically in the door but along a slightly inclined axis, in order for example to reduce friction with the window frame. This is because the alignment of the various lifting and reaction points 18, 20 and 24 can be selected almost at will to provide the desired line of force.

A further application of the regulating mechanism is in windows which move outwards during their travel so as to

lie flush with the bodywork when closed. The fact that the guides need not be linear for the regulating mechanism to operate satisfactorily permit it to operate in a variety of window and guide geometries.

A further feature of the invention is that the first lift system and the second lift system, that is to say the crank and the Bowden cable of the invention, are independent of one another and can therefore be installed or serviced separately. Such a modular approach simplifies assembly and servicing.

It should be also appreciated that a motor driven drum can be substituted for the manual crank so that the invention is equally applicable to electrically operated windows.

CLAIMS

1. A regulating system for a motor vehicle window located in guides in a vehicle door, which system comprises means for connection to one side of the window for raising and lowering the window within the window guides, and a Bowden cable connected in use only to the window and to the vehicle door and operative to move the other side of the window in synchronism with and in response to movement of said one side.

2. A regulating system as claimed in claim 1, wherein the outer sheath of the Bowden cable is mounted for movement with the window and the ends of the inner cable are anchored, in use, to fixed points on the vehicle door.

3. A regulating system as claimed in claim 1, wherein the outer sheath of the Bowden cable is fixed relative to the vehicle door and the ends of the inner cable are connected to the window.

4. A regulating system as claimed in any preceding claim, wherein the means for raising and lowering the window comprise a manually or electrically driven drum and a second Bowden cable acting between the vehicle door and the window to move the window in response to the rotation of drum.

5. A regulating system as claimed in claim 4, wherein the outer sheath of the second Bowden cable is fixed to the window frame and the inner cable has a central portion wound about the drum and its two ends connected to the window and to the vehicle door respectively.

6. A regulating system for a motor vehicle window located in guides in a vehicle door, constructed, arranged and adapted to operate substantially as herein described with reference to and as illustrated in the accompanying drawings.

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